# Wireless sensor networks (WSN) coordinator- IEEE 802.15.4 & Ethernet &GPS-Outdoor & Rugged Version

## Technical Note

TN_RF_009 – « BeanGateway® management on LAN infrastructure »

## Featured video

Click here to see the video of the BeanGateway® (Outdoor version)

MADE IN FRANCE

- **Wireless technology IEEE 802.15.4 coming with antenna diversity**
- **Ethernet/LAN interface with a server**
- **Advanced *UPS* (Uninterruptible power supply) with integrated rechargeable Lithium battery**
- **Data logger based on Micro-SD® (option)**
- **GPS receiver dedicated to Geotagging**
- **Watertight (IP67) & Robust Aluminum Enclosure**

## Applications

- Outdoor isolated sites (solar & wind energy farm, water/gas pipeline, mountains, water power plant …)
- WSN in Harsh Industrial Environment
- Embedded measurement
- Geotagging of alarm events on a wireless sensor network (IEEE 802.15.4)

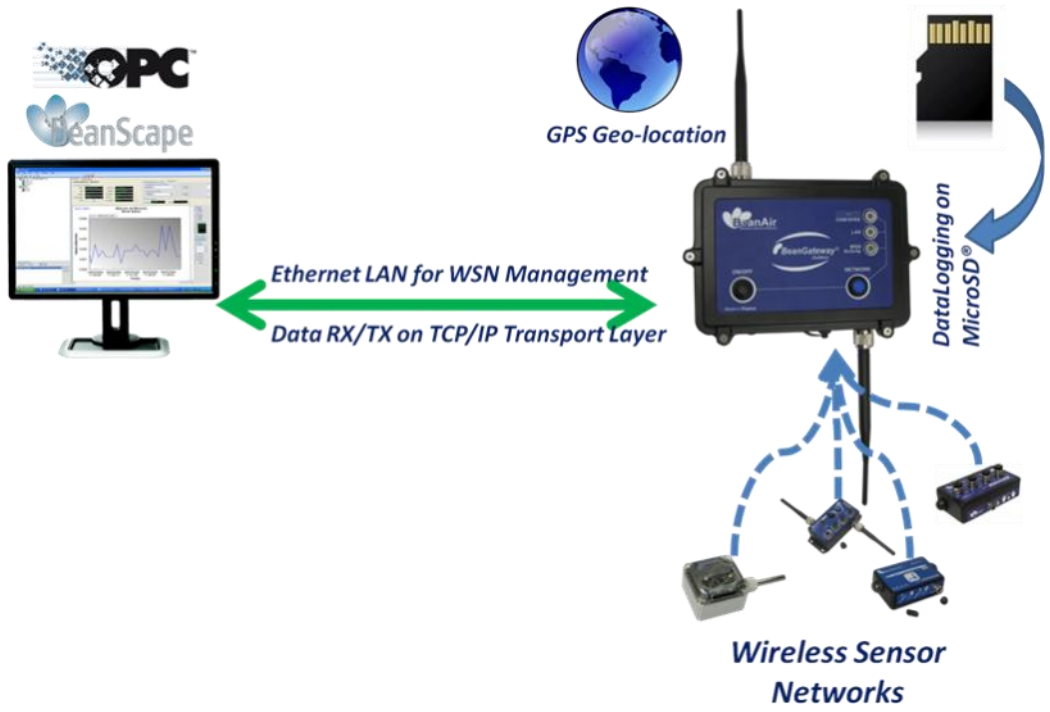
## Main features

- Builds and manages a Wireless Sensor Network (WSN) designed by **Beanair®**
- Wireless protocol stack : **IEEE 802.15.4**
- Link protocol with a server: TCP/IP/UDP/DNS/DHCP
- GPS Geo-Location, suitable for embedded measurement
- Maximum Radio range :1 km (L.O.S.)
- Embedded WSN Diagnostic tool
- Advanced ***UPS*** (Uninterruptible power supply) with integrated rechargeable Lithium battery
- Watertight (IP67) & robust aluminum enclosure
- WSN mapping & context is stored on embedded flash
- **« Plug & Play »** installation : no knowledge regarding wireless network is necessary
- Embedded files system for logging all the wireless sensors measurement (backup on **Micro-SD®**)
- Standard interface with our WSN Scada supervision software ***BeanScape®***.

## A multi-protocol WSN Coordinator

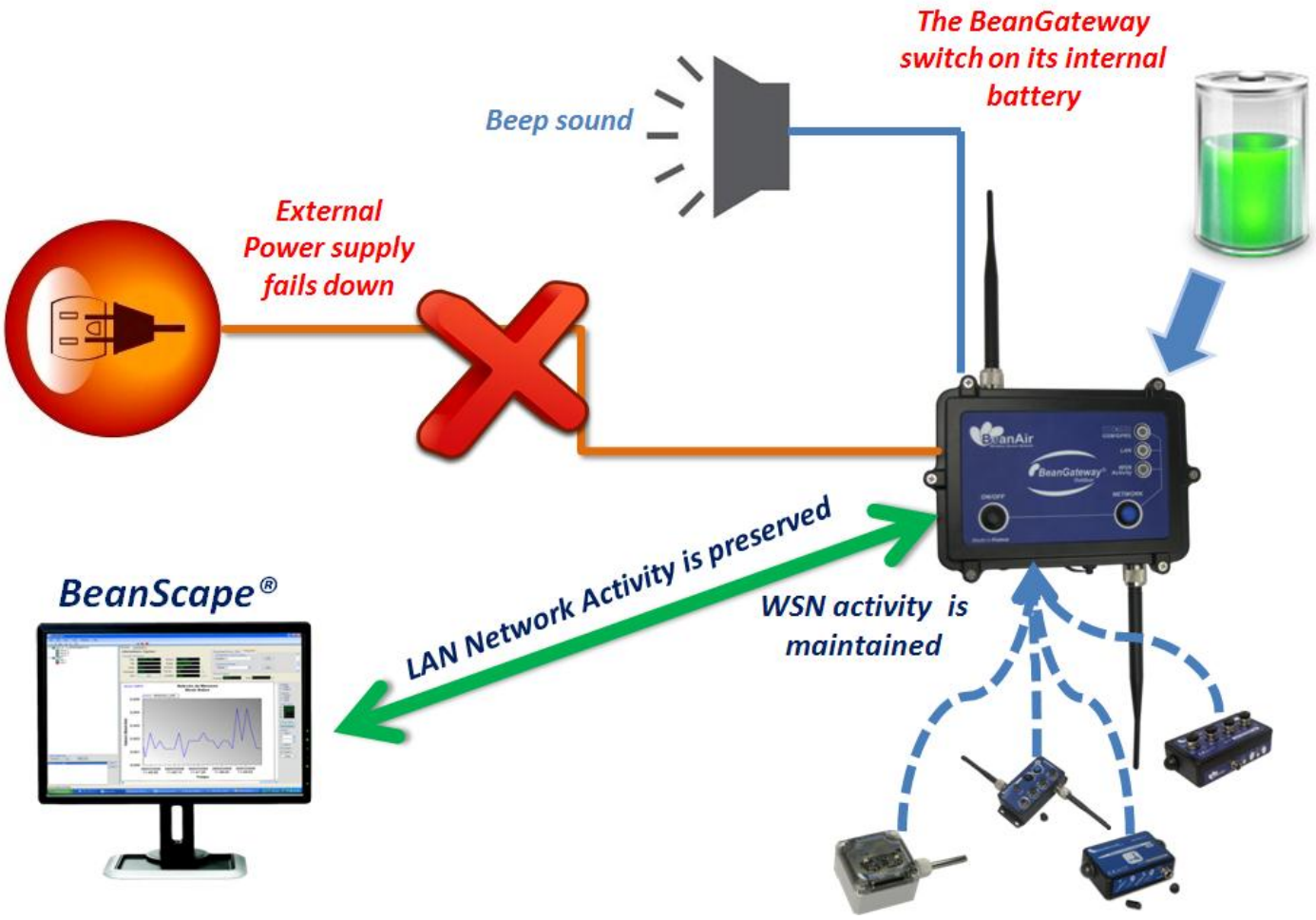
The ***BeanGateway® GPS*** is used to build and manage Beanair® wireless sensor network. It can manage queues for every network device (***BeanDevice®***). As a gateway, it controls the external access to the network through a highly secured authentication procedure. It supports the conversion of data exchanged, compression and IP connectivity with the network thereby reducing the intelligence required in these platforms, maintenance and therefore the associated cost.

The ***BeanGateway® GPS*** is also equipped with various communication interfaces with the customers IT infrastructure (RS232, Ethernet - TCP / IP / UDP / DHCP / DNS). With a client application TCP / IP, it can easily connect to a local application server (via the Ethernet).

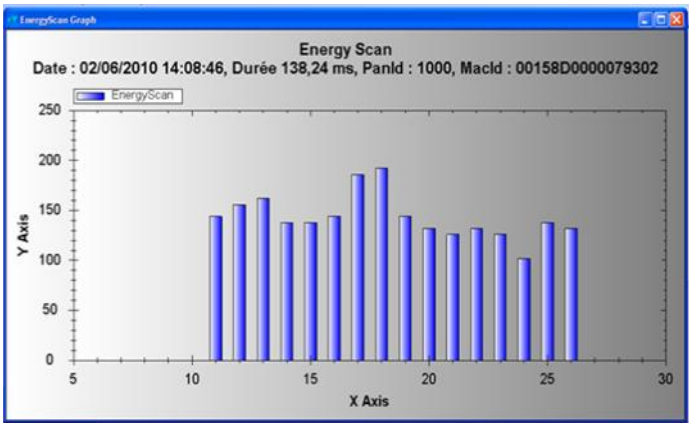


## Advanced uninterruptible power supply (UPS)

The ***BeanGateway® GPS*** operates with an external power supply (DC 8-28V). An integrated rechargeable battery with a capacity of 950mAh is used as an UPS battery (uninterruptible power supply). The internal battery provides instantaneous protection from external power supply interruptions, the wireless sensor network activity & Ethernet LAN activity are conserved during this time (3h00 to 3h30 approximately). An internal buzzer emits a beep sound every 2 seconds in case the external power supply is disconnected.


The BeanGateway switch on its internal battery
Beep sound
External Power supply fails down
BeanScape®
LAN Network Activity is preserved
WSN activity is maintained

## Embedded WSN diagnostic tool

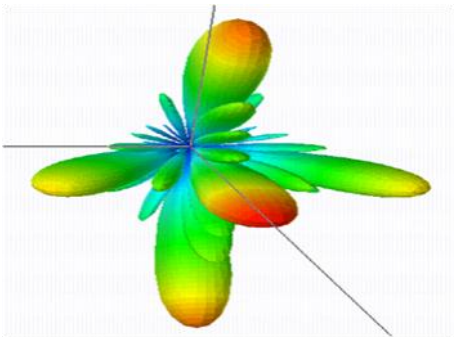



The ***BeanGateway® GPS*** provides a WSN diagnostic tool useful for resolving some common networking troubleshooting:

- **Energy Scan** for choosing the more appropriate RF Channel
- ***BeanDevice®* PER (Packet Error Rate)** calculation
- **LQI (Link Quality Indicator)** between the ***BeanGateway® Ethernet*** and the ***BeanDevice®***

The Energy Scan allows the user to know the network quality on each Radio channel. This operation allows the user to choose the appropriate RF channel on a site where the WSN is deployed.

## Antenna diversity



While the vast majority of wireless sensors shows their limits in harsh industrial environment, the ***BeanGateway® GPS*** integrates an innovative antenna diversity design, allowing to optimize the radio link quality in environments subject to random and diverse disturbance. Antenna diversity improves both the quality and reliability of a wireless link by 30%.

## Autonomous and smart

The ***BeanGateway® GPS*** has the capability to backup the WSN mapping & context. Thus the user can operate the WSN without any use of PC or IT server. All the data measurements are stored on an external Memory (Micro-SD® card) .

## Applications

### Modeling the handling of a vehicle

Through modeling the handling of a test vehicle, it can be equipped with wireless sensors (pressure, temperature, acceleration, inclination). The combination of wireless measurements with GPS geo-location can push the limits of modeling the behavior of the vehicle on a road.

### Remote monitoring of cargoes

The user can remotely monitor the status of his merchandise by instrumenting the cargo containers with wireless sensors. He can remotely track environmental parameters such as temperature, humidity or shock.

In case of exceeding a threshold alarm measurement (ex: increased temperature, shock detection ...), the merchandise is geo-located by GPS.

## GPS Geotagging

The ***BeanGateway® GPS*** integrates GPS function dedicated to test bench and telemetry applications on mobile equipment (train, car, ship).

With "***GPS Geotagging***" mode, a measure can be time-stamped, geo-located with precision and transmitted to the destination of ***BeanScape ®.***

(Source : Beanair – test bench on the « Plug & Drive » vehicle)

| *Product reference* |
|---|
| BGTW-GPS-OUT |

| Specifications | Wireless Sensor Network Coordinator |
|---|---|
| **Wireless Stack** | IEEE 802.15.4 |
| **WSN Topology** | **IEEE 802.15.4** Peer-to-peer/ Star |
| **Antenna Diversity** | Self-managed antenna diversity function |
| **Data rate** | 250 Kbits/s |
| **RF Characteristics** | ISM 2.4GHz – 16 Channels |
| **RF Transmit power** | Configurable transmit power: +0,5 dBm to +20 dBm |
| **Receiver sensitivity** | -95,5 dBm to -101 dBm |
| **Encryption** | AES 128 bits (integrated AES coprocessor) |
| **Maximum Radio Range** | 1 km (L.O.S.) |
| **WSN Diagnostic tool** | · Energy Scan for choosing a suitable RF Channel<br>· BeanDevice® PER (Packet Error Rate) calculation<br>· LQI (Link Quality Indicator) between the BeanGateway® GSM/GPRS and the BeanDevice®<br>· RF channels Blacklist |

| Specifications | Ethernet/LAN Network |
|---|---|
| **Network/Transport Protocol** | Client TCP/IP, UDP, DNS, DHCP |
| **Data Link Protocol** | Ethernet / Fast-Ethernet with auto-uplink (MDI/MDI-X auto) - IEEE 802.3x |
| **IP Addressing** | Dynamic (DHCP) or static |
| **IP configuration** | LAN parameters (DNS, DHCP, Keep Alive…) are configurable from the BeanScape® ( RS232 Interface or UDP/Ethernet Interface). |

| Specifications | Physical & Environmental |
|---|---|
| ***Dimensions (L x l x h)*** | 202 mm x142 mm x 55 mm |
| ***Enclosure/Finish*** | · Aluminium alloy ADC12 black finish<br>· Wall mounting holes (outside the sealing area) |
| ***IP Ratings*** | IP67 |
| ***Weight*** | 1220g |
| ***Connectors*** | · Power supply connector: M8-3P female socket, Ratings IP67, Contact brass with gold plated<br>· Ethernet connector : RJ45 Female, Ratings IP67, Contact copper alloy with gold plated<br>· Antenna connector: N-Type female, Ratings IP67<br>· ON/OFF push button : Latching push-button, Ratings IP67<br>· Network context push button: momentary push-button, Ratings IP67 |
| ***Operating temperature*** | -20 °C to +75 °C – with Integrated internal temperature sensor (resolution 0.125°C) |
| **Norms** | CE Labeling directive R&TTE (Radio) , ETSI EN 300 328 , ROHS - Directive 2002/95/EC, FCC Part 15 |

Product specifications are subject to change without notice. Contact Beanair for latest specifications.

| Specifications | GPS Features | |
|---|---|---|
| **GPS Technology** | SiRF Star 3<br>SBAS (WAAS & EGNOS) supported | |
| **Maximum refresh rate** | 1s | |
| **Frequency band** | 1575,42 MHz – 20 Channels | |
| **Sensivity** | High sensitivity for indoor use: -159 dBm (with an active antenna) | |
| **GPS Accuracy** | +/- 2,5 meters | |
| **Startup time** | Cold Start : < 35 seconds ; Warm Start : < 3 seconds | |
| **Amplified GPS Antenna** | Antenne GPS active +28,5 dB<br>V.S.W.R : 1.5:1<br>Noise Figure : 1.5 dB<br>Cable Length : 3m<br>Center frequency: 1575.42MHz ±1.023MHz<br>Watertight : IP67<br>Polarization : RHCP<br>Magnetic Mount | |
| **Operating Current** | 75 mA | |

| Specifications | Power |
|---|---|
| **Power Consumption** | 250 mA to 300 mA during wireless RX/TX and Ethernet activated |
| **External power supply** | +9V to +28 V , integrated Lithium-Ion battery charger with high-precision battery monitoring |
| **Integrated Lithium-Ion Battery** | Lithium-Ion rechargeable battery 950 mAh (reference BAT0.95DMG)<br>In case of external power supply failure, the BeanGateway® can switch on the internal battery. |

| Specifications | Accessories |
|---|---|
| **2.4 GHz Antennas** | Two antennas :<br>· High gain antenna 5,5 dBi<br>· V.S.W.R : 1.5 :1<br>· Connector : N-Type (Watertight) |
| **Ethernet Cable** | · RJ45 Male waterproof connector (casing side only)<br>· Cable length: 3 meters |
| **Wall plug-in power supply** | Wall plug-in, Switchmode power Supply 12V @ 1,25A |
| **Connectors cap** | M8-3P cap |

| Specifications | Options |
|---|---|
| **Embedded File System on Micro-SD®** | All the User data are stored on an external memory (Micro-SD® technology):<br>· Measurement storage for Wireless Sensor Network (network configuration, measurement, alarms notifications …) ;<br>· Maximum storage capacity (2Go)<br>· CSV files management (for exporting data on Excel® and Access®) |

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